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THE DEVELOPMENT OF WATER SUPPLIES IN EASTERN NIGERIA

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INTRODUCTION

1. The natural desire of the people for improved standard of living and Government's determination to diversify the economy by industrialisation and modern agricultural methods have created a most pressing need for providing potable water for domestic and industrial use in the urban as well as the rural areas. It is to meet this demand that the Eastern Nigeria Government has earmarked £6½ million in its current development programme (1962-68) for water supply to urban and rural inhabitants.

Although the limitation imposed by lack of adequate funds and data make the planning, design and construction of water supply installations rather difficult, the improvement in the health and the standard of living of the people served by the relatively small number of schemes so far completed, indicate that Government's decision is a step in the right direction.

2. Generally, water supply in Eastern Nigeria is classified into the following two main categories, all of which are maintained and operated on behalf of the community by the Ministry of Works.

(a) Urban Water Supplies. - Consisting of installations serving populations of between 10,000 and 150,000 people confined within a radius of 5 miles from the centre of population and providing water to meet domestic and industrial demands. So far, there are 14 such installations.

(b) Rural Water Supplies:

(i) Pumped and piped schemes which, as the name implies, provide pipe-borne water for rural communities with population of between 5,000 and 35,000 scattered over a very much wider area than is the case with (a) above. As it is to be expected, the cost of distribution main in such schemes (there are now 33 such schemes in construction or completed) is more than 60% of total cost of the schemes.

(ii) Waterpoints which consist of wells, spring improvements and shallow boreholes are designed to supply small communities. One such point is provided for 500 persons. There are presently 1,304 water points.

3. In addition to the above, there are institutional schemes which are essentially pumped and piped schemes constructed by Government to serve medical and educational institutions but which are operated and maintained by the institutions concerned.

GENERAL DESCRIPTION
TOPOGRAPHY, HYDROGEOLOGY, CLIMATE AND POPULATION.

4. Eastern Nigeria is one of the four constituent units forming the Federation and is self-autonomous in all matters except Foreign Affairs, Police and Communications which are the responsibilities of the Federal Government. Its erstwhile five provinces are now divided into twelve provinces varying in size between 806 square miles in the Annang Province and 3,699 square miles in Enugu Province, the total area covered by the region being 29,500 square miles(1).

5. It is of fairly uniform relief, the only highlands of note being Oban Hill in Calabar Province which rises to 3,770 feet above sea level and forms the hydrological centre of the region, the Enugu escarpment which is 1,715 feet above sea level and the Awgu-Okigwi-Bende group, which rises to 1,287 feet above sea level and forms the watershed for rivers which flow westerly into the Niger system or easterly as tributaries of the Cross River.

6. Apart from the Niger and Cross River systems into which a number of seasonal and perennial streams flow, the Imo and Kwa Ibo rivers flow into the Bight of Biafra at Opobo and Eket respectively.

7. All the four major rivers are subject to seasonal fluctuations of between 12 and 30 feet, a phenomenon which presents considerable problem in the design of intakes from these rivers or their tributaries. Along the last 140 miles of its flow and before discharging into the Bight of Biafra, the Niger develops into one of the most well-known deltaic formations in Africa, being 100 miles wide at its broadest point. Over 60% of the area covered by the delta is in Eastern Nigeria and although the area abounds in rivers and streams, it is one of the most difficult from the point of view of water supply, owing to the lack of easy access into it.

8. The region has two seasons:-

a., rainy season, which extends from March to October in the south and from April to September in the north, the mean annual rainfall being of the order of 120" in the south and 60" in the north; and

b., the dry season.

Temperature is fairly constant all the year round at 85°F and the relative humidity varies between 90% and 98% in the north and south respectively. Normally a figure of 22% and 55% of the total annual precipitation is allowed for run-off and evapo-transpiration respectively in the design of water supply schemes. So far, supply from impounded reservoir has been restricted to a small, experimental village scheme in the very difficult Cross River plain area and works of similar nature will depend on the result of observations now being made.

9. The principal geological division of Eastern Nigeria, is as shown in fig.1. From the point of view of water supply, each area except the

central (coastal sand) plain presents serious difficulties. Whilst groundwater condition in the Bende-Ameki and Imo shales group are unpredictable, groundwater in some parts of the delta area is susceptible to high salt content and cannot be used for domestic purpose without treatment. Also the Cross River plain, owing to the impermeability of the soil, has no suitable groundwater reserve within reasonable depth of the surface. Generally, geological data and information on groundwater movement are very sparse and a great deal of investigation and tests need to be carried out yet.

10. With regard to quality, groundwater is usually preferred as it can be put into reticulation with minimum treatment, aeration and pH correction. Surface water is usually soft and of good chemical quality, but is in most parts, heavily charged with pathogens and therefore need to be given full treatment - coagulation and/or sedimentation, filtration, pH correction and sterilisation before use.

11. Up to date, there had been three population censi taken, the result of the latest (1962) is now awaited. In the 1953 census, the population of Eastern Nigeria was recorded as 7,249,692, of which at least, 6 million were purported to be living in the rural areas(2). There are indications that a sizable increase has been recorded in the 1962 census. In view of the publicity and the preparatory work conducted prior to the census, this is not surprising.

12. In the design of water schemes, population increase of 1½% p.a. compound increase is adopted for rural schemes whilst a figure of between 8% and 3%, depending on nature of development, is used for urban schemes.

GENERAL POLICY

13. As indicated above, where groundwater is available in sufficient quantity and within reasonable depth, it is preferred to surface sources hence, a large number of pumped and piped schemes for rural areas depend on well and borehole sources. Five of the urban schemes are supplied from surface or a combination of underground and surface sources. In all but one of the installations where surface sources are used, provision is made for full treatment of the water.

14. Effort is now being made to standardise on pumping equipment with a view to facilitating training of operators and reducing the stock of spares held. Generally, 100% standby is provided for pumping equipment.

15. Except in very few cases where pressures are higher than those allowable for this type of pipes, asbestos cement pipes are used for both rising and distribution mains because of their low cost, speed and relative ease of construction. Until recently service connections were made with galvanised iron pipes but the use of polythene pipes for normal work and of copper for internal plumbing for high class buildings have been introduced.

16. Storage capacity of a minimum of one full-day's demand in 30 years for ground level reservoirs and a ½-day's demand for water towers is allowed in the design of new and improvement to existing schemes.

17. As of present, chemical analysis of all water is carried out by the Ministry of Commerce and bacteriological analysis by the Ministry of Health. It is proposed in due course to provide laboratory facilities in the Ministry of Works as it is thought that apart from providing a means of effective quality control, it is essential to relate the design

of schemes to the result of tests carried out on the raw water and this is only possible if the tests are carried out under the direct supervision of the engineers responsible for design.

CONCLUSION

18. I have indicated in chap.14 that the main reason for standardisation of equipment is to facilitate the training of operators. In a country where there is an abject lack of the simple practical knowledge of mechanical equipment amongst potential trainees, and quick servicing facilities are not available, the need for the training of operators cannot be over-stressed. This need is even more pressing in the water industry, for which there is, as yet, no organised training schemes. At the moment, the ratio of water supply employees to number of people receiving a piped water supply is less than 0.05 per 10,000 and this is by no means, due to the use of very efficient and labour saving plant and equipment.

19. There is no shortage of potential trainees and the present situation has only arisen from the fact that facilities for training were not available in the past. The development programme makes it incumbent on the Government to turn out waterworks staff much more quickly than would be expected in the more developed countries and it is the author's opinion that this demand can only be met by offering the necessary training in the course of the execution of their normal duties. In effect, the trainees should be taken on as apprentices with facilities provided for the continuation of their general and technical education at evening classes or part-time day classes. The advantage of such an arrangement is that the trainee will acquire experience and skill at the same time as he improves his education.

20. In order to ensure that trainees obtain the full benefit of such a scheme and to reduce the period of training to a minimum, it will be necessary to specify a basic educational qualification of Middle I V Secondary with a fair knowledge of mathematics, elementary physics and chemistry. The views of other participants on this subject will be very much appreciated.

21. Whereas it is agreed that urban water supply scheme should be financially self-sustaining, it is the author's view that for some time yet to come, rural water supply will need to be treated as a most essential social service for which Government should continue to provide subsidies. It is possible that some pumped and piped schemes will eventually develop into urban schemes but until that stage is reached, the improvement in the health of rural people resulting from provision of piped supply will justify Government contribution towards the capital and running cost of all rural schemes.

ACKNOWLEDGMENT

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1, 2 - Federation of Nigeria: DIGEST OF STATISTICS VOL.9, NO.3, JULY, 1961, by Federal Office of Statistics.

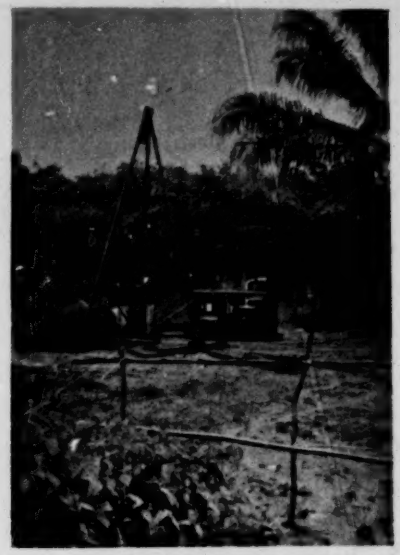


Fig. 1 Drilling for borehole
Nsukka

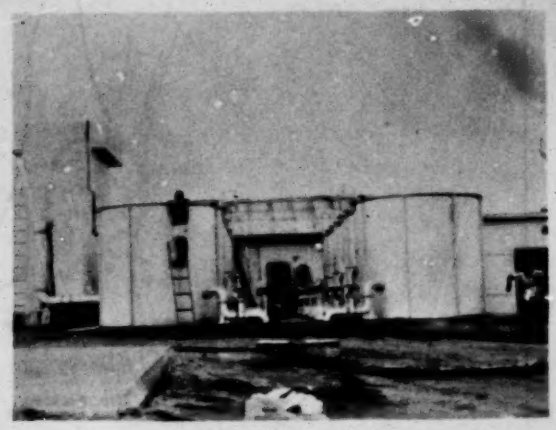


Fig. 2 High level pumphouse
Onitsha

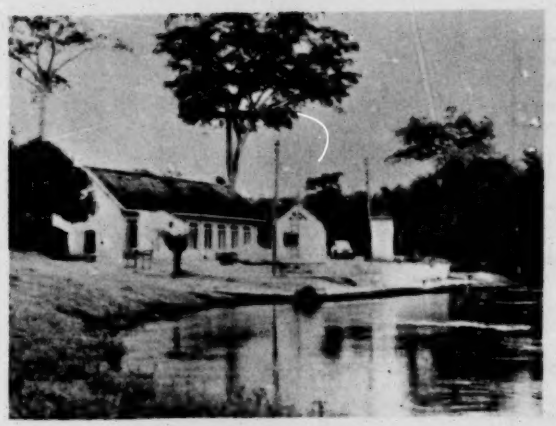
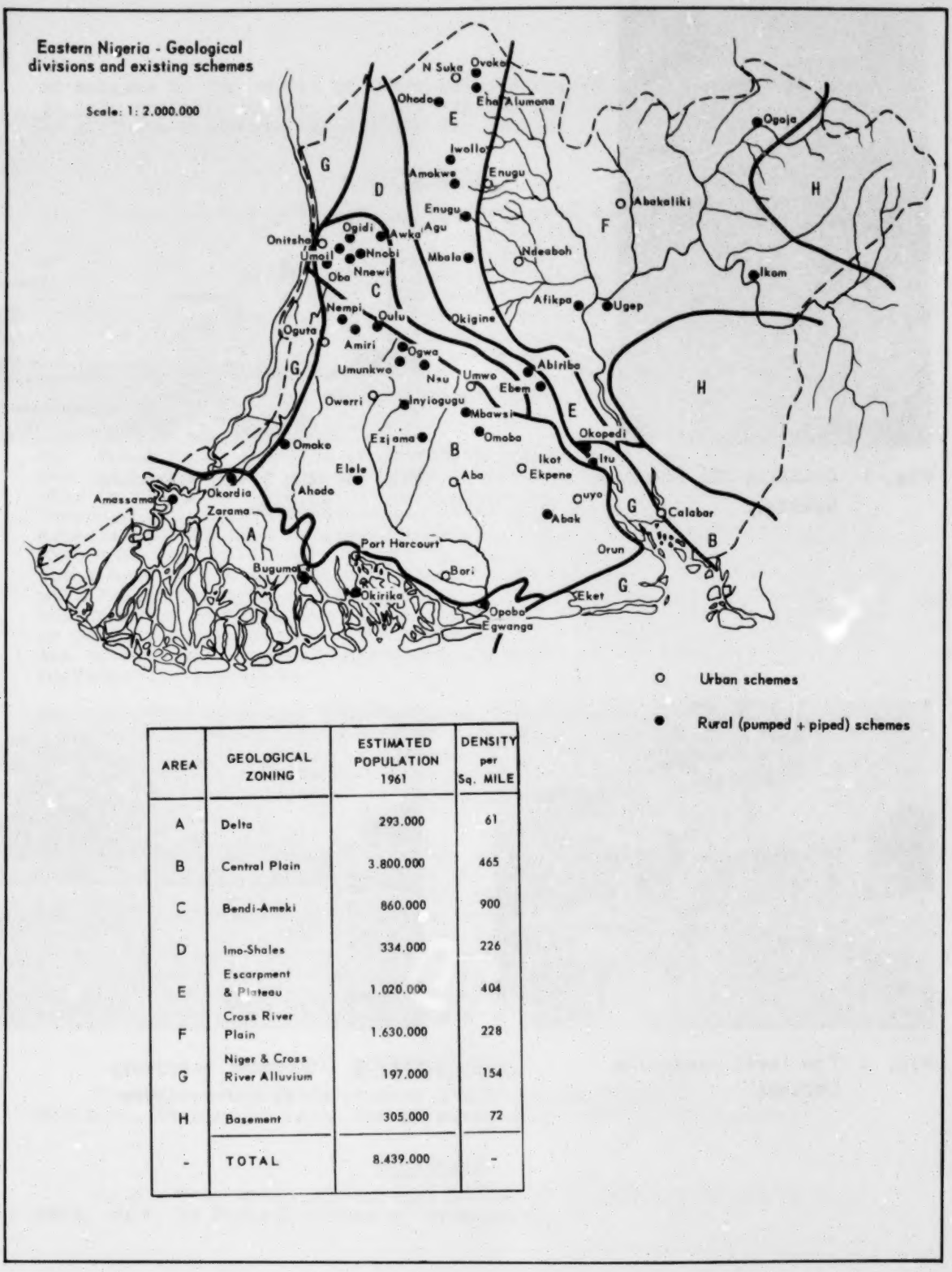


Fig. 3 Low level pumphouse
Onitsha

Fig. 4 Impounded reservoir
Abina rural scheme



AREA	GEOLOGICAL ZONING	ESTIMATED POPULATION 1961	DENSITY per Sq. MILE
A	Delta	293.000	61
B	Central Plain	3.800.000	465
C	Bendi-Ameki	860.000	900
D	Imo-Shales	334.000	226
E	Escarpment & Plateau	1.020.000	404
F	Cross River Plain	1.630.000	228
G	Niger & Cross River Alluvium	197.000	154
H	Basement	305.000	72
-	TOTAL	8.439.000	-

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